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(54) IMAGE SYNTHESIS DEVICE AND METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To make joints of images unremarkable in the case that a plurality of images whose exposure differs and whose parts are picked up overappingly are connected to obtain one panorama image.

SOLUTION: A cross reference point extract section 1 detects cross reference points of two input images a, b, a parameter estimate section 2 estimates a parameter to made coordinate transformation of the extracted cross reference points and a gradation correction coefficient decision section 3 obtains a coefficient to weight the images a, b based on the estimated parameter. Gradation correction control sections 4, 5 correct duplicate parts of at least either of the images a, b. An image synthesis conversion section 6 weights at least either of the images a, b and adds the result to the original image and synthesizes the sum image and the other image based on the parameter.
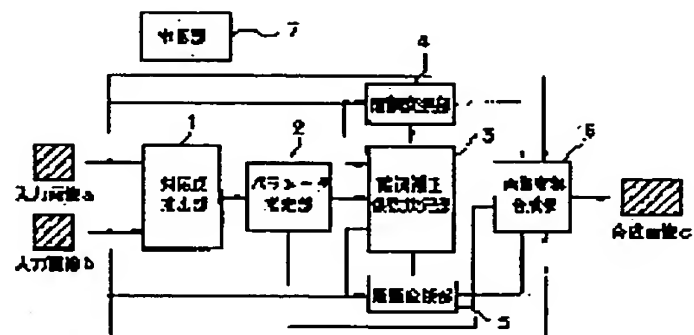
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CLAIMS

[Claim(s)]
[Claim 1] An extract means to extract corresponding points of the 1st image, this 1st image, and the 2nd image that has a duplication portion, A presumed means to presume a parameter for performing coordinate transformation of corresponding points which carried out [above-mentioned] the extract, An amendment means to amend at least one side of the 1st and 2nd image in the above-mentioned duplication portion based on a parameter which carried out [above-mentioned] presumption, An image synthesizer unit equipped with a synthetic means to carry out weighting at least of one side of the 1st and 2nd image by which amendment was carried out [above-mentioned], to add with the original image, and to compound this addition image and an image of another side based on the above-mentioned parameter.
[Claim 2] The above-mentioned synthetic means is an image synthesizer unit according to claim 1 characterized by performing the above-mentioned weighting according to distance from the above-mentioned duplication portion.
[Claim 3] The above-mentioned synthetic means is an image synthesizer unit according to claim 1 characterized by performing the above-mentioned weighting and addition in a predetermined field.
[Claim 4] The above-mentioned synthetic means is an image synthesizer unit according to claim 3 characterized by setting up the above-mentioned predetermined field based on the 1st and 2nd image in the above-mentioned duplication portion.
[Claim 5] The above-mentioned synthetic means is an image synthesizer unit according to claim 3 characterized by setting up the above-mentioned predetermined field based on a difference of each average of the 1st and 2nd image in the above-mentioned duplication portion.
[Claim 6] Corresponding points of the 1st image, this 1st image, and the 2nd image that has a duplication portion are extracted. Presume a parameter for performing coordinate transformation of these extracted corresponding points, and at least one side of the 1st and 2nd image of a thing in the above-mentioned duplication portion is amended based on a presumed parameter. An image composition method which carries out weighting at least of one side of the 1st and 2nd amended image, adds with the original image, and compounded this addition image and an image of another side based on the above-mentioned parameter.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] Two or more images with which some images overlap are used for this invention when compounding a panorama image with a field angle large in piles, and it relates to a suitable image synthesizer unit and a suitable method.
[0002]
[Description of the Prior Art] The method of performing geometric conversion of affine transformation etc. and connecting two images on a plane so that the same point in the field where an image overlaps as a method of compounding a panorama image with a large field angle may be in agreement conventionally from two or more images with which some images overlap is learned.
[0003]
[Problem(s) to be Solved by the Invention] However, in the above-mentioned conventional example, even when the image pick-up conditions of an input image differed by the factor of a photographic subject etc., especially exposure conditions differed and it was connected with a sufficient precision, there was a trouble that a joint was conspicuous, by the difference in the brightness of the input image in the same photographic subject. For example, the case where a photographic subject as shown in drawing 16 is picturized within the limit of frames f1 and f2 with an electronic "still" camera etc., respectively is assumed. Since the whole is dark, the place where the light exposure at the time of an image pick-up is dark is amended so that it may become bright, and, as for the photographic subject of a frame f1, an image like drawing 17 a is picturized. Moreover, since the whole is bright, the place where the light exposure at the time of an image pick-up is bright is amended so that it may become dark, and, as for the photographic subject of a frame f2, an image like drawing 17 b is picturized. Therefore, the joint by the difference in brightness arises with a synthetic image even when the input images a and b were connected with a sufficient precision, as shown in drawing 18 .
[0004] Therefore, the purpose of invention is offering the image synthesizer unit and method of compounding an image so that a joint's may not be conspicuous, even when the above-mentioned trouble is solved and the exposure conditions of an input image differ.
[0005]
[Means for Solving the Problem] An extract means to extract corresponding points of the 1st image, this 1st image, and the 2nd image that has a duplication portion in this invention, A presumed means to presume a parameter for performing coordinate transformation of corresponding points which carried out [above-mentioned] the extract, An amendment means to amend at least one side of the 1st and 2nd image in the above-mentioned duplication portion based on a parameter which carried out [above-mentioned] presumption, Weighting at least of one side of the 1st and 2nd image by which amendment was carried out [above-mentioned] was carried out, it added with the original image, and a synthetic means to compound this addition image and an image of another side based on the above-mentioned parameter is established.
[0006]

[Function] According to this invention, first, the corresponding points of the 1st and 2nd image are extracted, and the parameter for changing the coordinate of a mutual image from these corresponding points is presumed. Next, after amending one [at least] image of the duplication portion of the 1st and 2nd image based on the above-mentioned parameter and carrying out weighting of this amended image, it adds with the image of the origin of it and the synthetic image of one sheet is obtained by connecting this added image and the image of another side based on the above-mentioned parameter.

[0007]

[Embodiment of the Invention] The configuration of the image synthesizer unit by the gestalt of the operation of the 1st of this invention to drawing 1 is shown. a and b are input images, and with an electronic "still" camera, a video camera, etc., some images overlap and they are picturized. This is an image with which the exposure conditions at the time of an image pick-up as shown in drawing 17 a and b differ. 1 is the corresponding-points extract section and extracts the corresponding points in the image between the input images a and b. 2 is the parameter estimation section and presumes the parameter which performs image transformation from the extracted corresponding-points vector.

[0008] 3 is the gradation correction factor decision section, and determines the coefficient at the time of performing gradation amendment from the image data of the portion which the input images a and b overlap. 4 and 5 are gradation transducers, they perform gradation amendment to the input images a and b, respectively, and they amend it so that brightness in the field in which two images overlap may be made equal. 6 is the image transformation composition section, changes the image which amended the brightness of the input images a and b with a conversion parameter, and compounds it in one image. 7 is a control section which controls the whole image synthesizer unit.

[0009] Next, the actuation when generating the synthetic image c from the input images a and b is explained. Here, the case where the image data of the input images a and b is shade image data of N gradation, respectively is explained. First, a corresponding-points extract is performed in the corresponding-points extract section 1. The processing algorithm of the corresponding-points extract section 1 is shown in drawing 2 . A template logging field is first set up from Image a at step S21. At this time, since a duplication field is not known beforehand, let a predetermined field be a template logging field. Here, since the input images a and b are located in a line in order of the left and the right like drawing 17 , let 90 percent be the template logging field T in Image a from ten percent of a perpendicular direction 30 percent from the horizontal right end of Image a like drawing 3 . And the small field t of the magnitude of about ten percent of image size is started in the block unit which divided this field T. If it has stood in a line in order of the upper bottom at this time a and b, for example, input images, it is good from the lower limit of the perpendicular direction of Image a to make 90 percent into the template logging field in Image a from 30 percent and ten horizontal percent. Next, the following steps S23-S25 are processed about all the templates started at step S22.

[0010] At step S23, the field searched for the point corresponding to the started template is set up from Image b. Since a duplication field is not beforehand known at this time, let a predetermined field be a seek area. Here, let the location of **ten percent be a seek area S like drawing 4 from the location in the image a of the horizontal left end of Image b to a template. If the duplication field of the input images a and b is horizontal, and is 50 or less percent and this entry is perpendicular, it is based on the conditions of not shifting, **ten percent or more. What is necessary is just to change a setup of the retrieval range of this corresponding-points extract, when the duplication conditions the input images a and b are assumed to be differ.

[0011] In drawing 4 , the seek area S at the time of making into a template the field t shown with the slash of Image a is shown. At step S24, the template is shifted in parallel within this seek area S, and difference with Images a and b is calculated. And total of the absolute value of a difference makes the location used as min a corresponding-points location.

[0012] At step S25, reliability over the result of step S24 is judged. The judgment of reliability judges with reliability being in corresponding points, when there is a difference of the value and the minimum value with total of the minimum value of total of the absolute value of the

difference used as the minimum value of the absolute value of below the 1st predetermined threshold and a difference small to the 2nd beyond the 2nd predetermined threshold, and it stores the coordinate in the images a and b of corresponding points in the memory in the corresponding-points extract section 1.

[0013] In addition, although total of the absolute value of a difference made the location used as min the corresponding-points location here, it is good also considering the location where a correlation operation is performed, for example and a correlation value serves as max as a corresponding-points location. Moreover, although the above-mentioned processing extracted the corresponding points of the input images a and b from image data, two images a and b may be displayed on a display, and the same point in an image may be specified and extracted with cursor etc., for example.

[0014] In the parameter estimation section 2, the parameter of coordinate transformation is presumed from the extracted corresponding-points location. At this time, affine transformation is performed as coordinate transformation. Supposing Image b is in one m times the relation [theta rotation, a parallel displacement (dx, dy), and] of this that carried out expansion conversion to Image a, the point in Image a (xa, ya) is equivalent to the point (xb, yb) in the image b of the following degree types (1).

xb=(cos theta-xa+sin theta-ya-dx) xm =A-xa+B-ya+C yb=(-sin theta-xa+cos theta-ya-dy) xm =-B-xa+A-ya+D however -- A=m-costheta, B=m-sintheta, C=-m-dx, and D=-m-dy ...... (1)

[0015] The parameters A, B, C, and D at this time are presumed in the parameter estimation section 2 with a least square method. However, when the number of the corresponding points which at least two pairs of coordinates of corresponding points are required, and were able to be found in quest of the parameter is one, let the average of the corresponding-points vector which was able to be found to 1/2 image be a parallel displacement parameter. That is, when setting the average of a corresponding-points vector to (ax, ay), a parameter is set up and outputted like a degree type (2).

A= 1, B= 0, C=-ax, D=-ay ...... (2)

[0016] Moreover, a message is outputted to CRT and processing is ended without corresponding points' performing future processings, when one pair cannot be found, either. In case the presumed parameter predicts the duplication section, it is used.

[0017] On the other hand, in the gradation transducers 4 and 5, gray scale conversion is performed to the input images a and b, respectively, and it amends so that brightness in the field in which two images overlap may be made equal. The gradation correction factor decision section 3 determines the correction factor for it.

[0018] The processing algorithm of the gradation correction factor decision section 3 and the gradation transducers 4 and 5 is shown in <u>drawing 5</u> . At step S1, it judges whether the coordinate value in each input image is in the duplication section first using the output parameter of the parameter estimation section 2. That is, affine transformation is performed according to a formula (1), each coordinate value of the input image a is changed into the coordinate value of the input image b, and this coordinate value judges whether it is the inside of the field of Image b.

[0019] Next, it is Pa1 about the input images a and b, respectively about the pixel value judged that is in duplication circles in step S2. And Pb2 It carries out. It is Pak about the pixel value which performs same processing and corresponds to the coordinate value of the input image a. And it is referred to as Pbk (k= 1 - N). In addition, every pixel is sufficient as the sampling of a pixel value, and it may sample at intervals of arbitration. Moreover, it is also possible to make the average value of a neighboring pixel value into sample data based on the coordinate of the corresponding points obtained with a parameter as a sampled value.

[0020] Next, sample data Pak which can be found by processing of the above-mentioned step S2 And Pbk A radical is asked for a gradation correction factor by step S3. <u>Drawing 6</u> shows the outline of gradation correction factor calculation. Setting to <u>drawing 6</u> , breadth is the sample data Pbk of Image b. It is a pixel value and a dip is the sample data Pak of Image a. A pixel value is expressed. In step S3, the transform function (function 900 of <u>drawing 6</u>) for making the pixel value of one image in agreement with the pixel value of another side based on the above-

mentioned sample data is generated.

[0021] As transformation, the following secondary functions which change the pixel value of Image b here are generated.

f(Pb) =Tb1 xPb2+Tb2 xPb+Tb3 ...... (3)

[0022] Coefficients [Tb / Tb and / 2] 1 for generating f (Pb) of a formula (3) in step S3 And Tb3 It asks. They are the coefficients [Tb / Tb and / 2] 1 which make epsilon of a degree type min with the least square method as a method. And Tb3 It computes.

Epsilon=sigma [Pak− (Tb1 xPbk 2+Tb2 xPbk+Tb3)]
...... (4)

[0023] The coefficient computed by the gradation correction factor decision section 3 is given to the gradation transducers 4 and 5. In addition, since it is asking for the coefficient which makes the pixel value of Image b in agreement with Image a here, it is the gradation correction factor of Image a. Ta1 and Ta2 And Ta3 It is set to Ta 1 = 0, Ta 2 = 1, and Ta 3 = 0 if it attaches.

[0024] Next, according to the gradation correction factor given by the gradation amendment transducers 4 and 5 in step S4, the pixel value of each images a and b is changed. Hereafter, actuation of the gradation amendment transducer 5 is explained. It sets to the gradation transducer 5 and is a gradation correction factor. Tb1, and Tb2 and Tb3 The table for changing the gradient of Image b into a radical is created. If the dynamic range of an image is made into 8 bits, the table 910 for changing the pixel values 0−255 of Image b into f (0) − f (255) with the secondary function of a formula (3), as shown in drawing 7 will be generated. Although the same is said of the gradation amendment transducer 4, since the pixel value of Image a is not changed here, it becomes the table which changes the pixel values 0−255 into 0−255.

[0025] In addition, in the case of a color picture, a transform function common to RGB may be generated and performed about gray scale conversion. Moreover, although the secondary function was used as a transform function here, it cannot be overemphasized that it is also possible to use other function forms and it is possible to perform gray scale conversion on a nonlinear table.

[0026] In the image transformation composition section 6, one synthetic image is generated by the last based on the image and input image by which gradation amendment was carried out by the gradation transducers 4 and 5, respectively. In the image transformation composition section 6, the synthetic image c is generated according to the algorithm shown in drawing 8 . The image field of the synthetic image c is first set up at step S51. Here, a setup of an image field is performed on the basis of the system of coordinates of the input image a, and it sets up like the field shown with the dashed line of drawing 9 . That is, make the left end of the synthetic image c into the left end coordinate of Image a, and let a right end be the coordinate of the larger one among the coordinates which changed and asked the coordinate of Image a for the pixel of the top right corner of Image b, and a lower right edge.

[0027] For changing the coordinate of Image b into the coordinate of Image a, the inverse transformation of the affine transformation of a degree type (5) is used. When the parameter of inverse transformation is made into A', B', C', and D', the formula (5) shown below will be changed.

xa=A', xb+B', andyb+C' ya=−B', xb+A', and yb+D' however −− A'=A/(A2+B−2)
B'=−B/(A2+B−2)
C'=(−AC+BD)/(A2+B−2)
D'=(−BC−AD)/(A2+B−2) ...... (5)

[0028] Moreover, let the coordinate value of the smaller one, and a lower limit be the coordinate values of the larger one among the coordinates which changed and asked the coordinate of Image a for the pixel of the lower limit coordinate value of Image a and the lower right edge of Image b, and a lower left edge among the coordinates which the upper limit of the synthetic image c changed the pixel of the upper limit coordinate value of Image a and the top right corner of Image b, and an upper left edge into the coordinate of Image a, and were searched for.

[0029] At step S52, as it indicated that the location of a joint took the lead in the duplication section with the dashed line L of drawing 9 , it sets up. That is, let the average with the coordinate value of the smaller one be the location of a joint among the coordinates which

changed and asked the coordinate of Image a for the right end coordinate value of Image a, and the pixel of the upper left edge of Image b, and a lower left edge. At step S53, a pixel value is calculated from the field of the synthetic image c set up at step S51, respectively.

[0030] At step S54, as shown in drawing 10 , gray-scale-conversion field 2W of predetermined width of face are set up focusing on knot L. Next, to what is 140in field of Image a a, and is outside a gray-scale-conversion field, the pixel value of the original image a is written in as it is. Moreover, to the thing in a gray-scale-conversion field, a degree type (6) determines the pixel value P in the field of Image a according to the coordinate location written in based on the translation table of the gradation transducer 4.

$P=\{Pax(dxa/W)\}+f(Pa) - \{1.0- (dxa/W)\}$

...... (6)

Here, as shown in drawing 10 , dxa is written in from knot L and is the distance to a coordinate location.

[0031] Next, writing is similarly performed about the field of Image b. To what is in 140in field b of the image b of drawing 10 , and is outside a gray-scale-conversion field, the pixel value of the original image b is written in as it is. Moreover, to the thing in a gray-scale-conversion field, a degree type determines the pixel value P in the field of Image b according to the coordinate location written in based on the translation table of the gradation transducer 5.

$P=\{Pbx(dxb/W)\}+f(Pb) - \{1.0- (dxb/W)\}$

...... (7)

Here, as shown in drawing 10 , dxb is written in from knot L and is the distance to a coordinate location.

[0032] Thus, the image of the synthetic image c for which it asked becomes like drawing 11 . the portion shown with the slash by drawing 11 -- Images a and b -- allocation of a pixel should do also from either -- dummy pixels (for example, white pixel etc.) enter in the field which is not.

[0033] Drawing 12 shows the outline of the pixel value in Rhine H of drawing 11 . Here, since the pixel value of Image a remains as it is, the pixel value on the left-hand side of knot L is a pixel value of the original image a. Moreover, about the right-hand side of knot L, processings differ by whether it is in the gray-scale-conversion field W. That is, about the pixel value in the gray-scale-conversion field W, it is the pixel value 133 which changed the pixel value 132 changed according to the amendment table of the original pixel value 131 of Image b, and the gradation transducer 5 according to the formula (7). Furthermore, the field outside the gray-scale-conversion field W serves as a pixel value of the original image b.

[0034] In addition, in the above-mentioned explanation, although the image transformation composition section 6 wrote in by dividing into the field of Image a, and the field of Image b focusing on a knot, it may set up a field about the duplication section of each image, may carry out weighting addition of the pixel value of each image in it, and may generate the pixel value of a synthetic image. The image c compounded by the above processing is outputted to CRT, a printer, etc.

[0035] Next, the gestalt of operation of the 2nd of this invention is explained. The configuration of the image synthesizer unit by the gestalt of this operation is the same thing as the 1st configuration of the gestalt of operation shown in drawing 1 , and since only the function and actuation of the gradation transform coefficient decision section 3 and the image transformation composition section 6 differ from each other, actuation of this portion is explained hereafter. In the gradation transform coefficient decision section 3 of the gestalt of this operation, gray-scale-conversion field 2W are set up based on the pixel value of the duplication section of the input images a and b. Like the gestalt of the 1st operation, as shown in drawing 13 , it is sample data Pak based on the pixel value of the image a of the duplication section, and Image b. And Pbk Although generated, it is the difference dPavg of the average of sample data respectively at this time. Coincidence is asked. Difference dPavg of the calculated average It gives the image transformation composition section 6.

[0036] dPavg obtained in the image transformation composition section 6 Gray-scale-conversion field 2W are set to a radical by the degree type.

$2W=Yx (dPavg/255)$ ...... (8)

However, Y shows the breadth of an image. dPavg in a formula (8) The difference of the gradient of each image in the duplication section is expressed, and it is set to 255 at the maximum, and is set to 0 by min. case [therefore,] a level difference is large -- gray-scale-conversion field 2W -- being large . 2W become small when a level difference is small.

[0037] As hereafter shown in <u>drawing 11</u> and 12 like the gestalt of the 1st operation, a pixel value is written in and a synthetic image is generated. According to the gestalt of this operation, since a gray-scale-conversion field is set up accommodative according to the level difference of the duplication section, smooth gradation amendment suitable for an image can be performed.

[0038] Next, the gestalt of operation of the 3rd of this invention is explained. The configuration of the gestalt of this operation is the same as the configuration of <u>drawing 1</u> almost, and since only the methods of gradation amendment differ, only the method of the gradation amendment is explained below. With the gestalt of this operation, as sample data is extracted like the gestalt of the 1st operation based on the pixel value of the duplication section of Image a and Image b and it is shown in <u>drawing 6</u> , each sample data is connected. In the gestalt of the 1st operation, the transform function for making the gradient of Image b in agreement [each sample data] with Image a with the least square method based on relation is generated, and gray scale conversion is performed, therefore only an image b performs conversion of a pixel value.

[0039] On the other hand, with the gestalt of this operation, the pixel value of each image is changed and gradation amendment is performed. That is, from the relation shown in <u>drawing 6</u> , a transform function is generated and a gradation correction factor is given to the gradation transducers 4 and 5. However, a transform function makes the pixel value of Image b in agreement with Image a like the gestalt of the 1st operation.

[0040] The gradation transducer 5 changes gradation with a transform function based on the pixel value of Image b. Here, conversion is performed by the following formulas 9, using as f (Pb) the pixel value into which the pixel value of the original image b was changed by Pb and the transform function.

$$Pb'= \{Pb+f(Pb)\}/2 \ ...... \ (9)$$

That is, the original pixel value Pb and the average of pixel value f (Pb) obtained by the transform function perform gray scale conversion.

[0041] On the other hand, in the gradation transducer 4, the degree type 401 performs gray scale conversion.

$$Pa'=Pa- [\{f(Pb)-Pb\}/2] \ ...... \ (10)$$

However, Pa is the original pixel value of Image a.

[0042] The outline of the above-mentioned gray scale conversion is shown in <u>drawing 14</u> . By subtracting and adding 1 / 2 minutes of offset f(Pb)-Pb of transform-function f (Pb) and the original pixel value Pb to Image b and Image a, as shown in <u>drawing 14</u> , gray scale conversion is performed. Thereby, gradation amendment is performed when each pixel value compromises mutually. The pixel value after the conversion generated in each gradation transducers 4 and 5 is held in table format like <u>drawing 7</u> like the gestalt of the 1st operation.

[0043] Hereafter, in the image transformation composition section 6, the writing of a synthetic image is performed like the gestalt of the 1st operation. About the image compounded by the gestalt of this operation, <u>drawing 15</u> shows the outline of the pixel value of Rhine H of <u>drawing 11</u> . It turns out that the pixel value of each image compromises and gradation amendment is carried out.

[0044]

[Effect of the Invention] Since gradation amendment is performed in the field in which the same photographic subject of the duplication portion of an input image is picturized according to invention of claims 1 and 6 as explained above, even when the exposure conditions of an input image differ, a synthetic image can be obtained so that a joint may not be conspicuous.

[0045] Moreover, according to invention of claim 2, since the coefficient of weighting is set up according to the distance from the knot of a synthetic image, the synthetic image by which gray scale conversion was carried out smoothly can be obtained. Moreover, according to invention of claim 3, since gray scale conversion is performed only in a predetermined field, the time amount which processing takes can be reduced and the synthetic image which does not have sense of

incongruity to the image before conversion further can be obtained.

[0046] Moreover, since the field which performs gray scale conversion based on the image of the duplication portion of an input image is set up according to invention of claim 4, the gradation amendment and composition suitable for an image will be performed, and the synthetic image of high quality can be obtained. Moreover, since the field which performs gray scale conversion based on the difference of the average of the image of the duplication portion of an input image is set up according to invention of claim 5, it is suitable for an image and the synthetic image by which gray scale conversion was carried out smoothly can be obtained.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing the configuration of the image synthesizer unit by the gestalt of the 1-3rd operations of this invention.
[Drawing 2] It is the flow chart which shows the processing algorithm of the corresponding-points extract section.
[Drawing 3] It is the block diagram showing how to start the template in a corresponding-points extract.
[Drawing 4] It is the block diagram showing the setting method of the seek area in a corresponding-points extract.
[Drawing 5] It is the flow chart which shows the processing algorithm of gradation amendment.
[Drawing 6] It is property drawing showing the relation of sample data.
[Drawing 7] It is the block diagram of the change table of a gradation transducer.
[Drawing 8] It is the flow chart which shows the processing algorithm of the image transformation composition section.
[Drawing 9] It is a block diagram explaining the image composition method.
[Drawing 10] It is a block diagram explaining the image composition method.
[Drawing 11] It is the block diagram showing an example of a synthetic image.
[Drawing 12] It is property drawing showing an example of a synthetic image.
[Drawing 13] It is a block diagram explaining the extract of the sample data based on the gestalt of the 2nd operation.
[Drawing 14] It is property drawing explaining the gray scale conversion by the gestalt of the 3rd operation.
[Drawing 15] It is property drawing explaining the image composition by the gestalt of the 3rd operation.
[Drawing 16] It is the block diagram showing the image pick-up condition of the image to compound.
[Drawing 17] It is the block diagram showing an example of an input image.
[Drawing 18] It is the block diagram showing an example of the conventional synthetic image.
[Description of Notations]
1 Corresponding-Points Extract Section
2 Parameter Estimation Section
3 Gradation Correction Factor Decision Section
4 Five Gradation transducer
6 Image Transformation Composition Section
7 Control Section

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